

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-4, 6-7, 9-11, 15-19, 21-30, 32-40, 42-49, 51-52 and 54-59 are presently pending in this application, Claims 1, 10, 18, 25, 28-29, 32, 37-38, 39, 44, 46-47, and 54 amended by way of the present amendment.

In the outstanding Office Action, 1-4, 6-7, 9-11, 15-19, 21-30, 32-40, 42-49, 51-52 and 54-59 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. 5,764,833 to Kakii et al., in view of U.S. Patent No. 6,655,856 to Nakanishi et al. and further in view of U.S. 2004/0228601 to Porter et al.

Turning now to the merits, in order to expedite issuance of a patent in this case, Applicants have amended independent Claims 1, 10, 18, 25, 44 and 54 to clarify the patentable features of the claimed invention over the cited references. Specifically, amended Claim 1 recites an optoelectronic module including an optical fiber block, a plurality of optical fibers having fiber facets terminating on an end face of the optical fiber block and a submount disposed adjacent to the end face of the optical fiber block. An edge emitting laser diode array is disposed on the submount in optical alignment with the fiber facets of the optical fibers, and a cap is disposed on the submount and detachably adjoining the end face of the optical fiber block. The cap encloses the edge emitting laser diode array and the fiber facets therein, and augments the contact area between the submount and the fiber block. A resin encapsulates the array in the cap, the resin being substantially transparent to light wavelengths passing between the array and the fiber facets, and the cap has an injection hole for introducing the resin in an initially fluid uncured state into a chamber formed by the cap,

the submount and the end face of the optical fiber block such that the fluid resin is contained by the cap in the uncured state.

Thus, Claim 1 has been amended to recite that the cap augments the contact area between the submount and fiber block. Claims 18 and 54 include similar features in method claim format. Generally, optoelectronic modules are conventionally packaged in a module housing containing a printed circuit board having mounted thereon electronic circuits and devices for electronic signal processing, and an optical assembly which interfaces the electronic circuit of the module to an optical fiber link. This optical assembly normally includes a semiconductor diode array mounted in optical alignment with the fiber facets of an optical fiber array supported in a fiber block. Here, each diode array is typically disposed on a single semiconductor chip where the diodes are arranged on the chip as an evenly spaced linear array on a common surface or edge of the chip. These semiconductor chips are small and delicate. Interconnecting of the diodes of the array to the electronic circuits of the optoelectronic modules is accomplished by wire bond connections of very thin wire between the diode array chip and conductive traces on a submount.

The diode array chip with its wire bonds is mechanically delicate and susceptible to mechanical damage or breakage while being handled in the process of alignment and assembly of the module. The diode chips are also vulnerable to degradation by airborne pollutants, and the fiber facets are adversely affected by condensation of moisture. The invention of Claims 1, 18 and 54 addresses these problems with a cap disposed on the submount and detachably adjoining the end face of the optical fiber block and enclosing the edge emitting laser diode array and the fiber facets therein, which augments the contact area between the submount and the fiber block. That is, in order to address the problems described above with respect to conventional modules, it is important to configure the enclosure with a submount, an optical fiber block and a cap as at least three elements so that

that the cap can augment the contact area between the submount and optical fiber block. As discussed in Applicant's specification, the larger contact area facilitates the alignment process by stabilizing the two parts (i.e. the submount and the fiber block) relative to each other during alignment, as well as providing a larger bonding area for greater mechanical strength of the completed assembly.

Fig. 20 of Kakii et al. discloses an optical fiber array F bonded with the parallel optical transmission module M. As seen in this figure, a case 31 is provided at the exterior of the optical module M, and the optical fiber array F is bonded to the case 31. Therefore, the enclosure of Kakii et al. is comprised of only two elements, i.e. the optical module 11 and the case 31. Similarly, the figures of Nakanishi et al. show outer and inner containers 25 and 26 having a bottom plate 27 joined therebetween. A substrate 29 is accommodated in the inner container 26, and an LD 30 is fixed on the substrate 29. Further, a top plate 37 is covered at the upper portion of the outer container 25. Thus, the enclosure of Nakanishi et al. is also comprised of only two elements, i.e. the outer container 25 and the top plate 37. As KaKii et al. and Nakanishi et al. disclose an enclosure with only two components, they cannot disclose a third component that "augments" the contact area of the other two components. Specifically, these cited references do not disclose a cap that augments a contact area between the submount and optical fiber block. Therefore, independent Claims 1, 18 and 54 patentably define over the cited references.

With regard to independent Claim 10, this claim has been amended to recite that the "spacer interposed between the submount and the end face is configured to provide connective coupling between the submount and the endface such that the spacer encloses the diode array and fiber facets when the submount is coupled to the endface by way of the spacer." An example embodiment covered by amended Claim 10 is shown in Fig. 7. As seen in this figure, the spacer 64 is interposed between the endface of the block 28 and the

submount 62 such that the spacer provides connective coupling between the submount and the endface. That is, there is no direct contact between the endface and submount, but rather only a coupling therebetween provided by spacer 64. In contrast to Claim 10, the cited references to Nakanishi et al. and Kakii et al. disclose an enclosure made of only two components and cannot disclose a third component that augments coupling between the other two components. Therefore, the references also do not disclose a spacer as recited in Claim 10.

Applicants have amended independent Claim 25 to recite that a “containment dam provided between the submount and the endface such that the containment dam encloses the diode array and fiber facets provide connective coupling between the submount and endface, or augment a contact between the submount and endface.” Claim 44 recites a “chamber forming device that provides connective coupling between the submount and the end face or augments a contact area between the submount and the endface.” That is, independent Claims 25 and 44 each recite the features distinguished above in the alternative form. Therefore, Claims 25 and 44 patentably define over the cited references for the reasons discussed above.

The reference to Porter et al. is cited for teachings of the dependent claims and does not correct the deficiencies noted above. Finally, Applicants submit that even if all the limitations can be gleaned from the cited prior art, one of ordinary skill in the art would not combine the Nakanishi et al. reference with the Kakii et al. reference in order to arrive at the claimed invention. In Nakanishi et al., an optical fiber 34 itself is inserted into an inner container and is to be covered entirely by a resin to be filled in the inner container. Contrarily, in Kakii et al., an optical fiber is disposed in an optical block that is not filled with a resin. Accordingly, there is disincentive to combine Nakanishi et al. and Kakii et al. to arrive at the invention of any of the independent claims.

For the reasons discussed above, independent claims 1, 10, 18, 25, 44 and 54 patentably define over the cited references. As the remaining pending claims in this case depend from 1, 10, 18, 25, 44 or 54, these dependent claims also patentably defined over the cited references.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application. The present application is believed in condition for formal allowance. An early and favorable action is therefore respectfully requested.

Respectfully submitted,

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